

What Is Claimed Is:

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- 5      *Sub B1*      1. An unleaded gasoline fuel, which is substantially free of oxygenates and has a Reid vapor pressure less than 7.5 psi; a sulfur content less than 30 ppmw; an aromatics content of greater 25 volume percent but no greater than 30 volume percent; and the fuel composition fails the California Predictive Model requirements for emissions.
- 10      2. The unleaded gasoline fuel of claim 1, wherein the olefin content is 8.0 volume percent or less.
3. The unleaded gasoline fuel of claim 2, wherein the fuel has a Reid vapor pressure no greater than 7.0.
- 15      4. The unleaded gasoline fuel of claim 1, wherein the fuel has no greater than 20 ppmw sulfur.
5. The unleaded gasoline fuel of claim 2, wherein the fuel contains no greater than 20 ppmw sulfur.
6. The unleaded gasoline fuel of claim 2, wherein the fuel contains no greater than 15 ppmw sulfur.
- 20      7. The unleaded gasoline fuel of claim 2, wherein the fuel contains no greater than 10 ppm sulfur.

8. The unleaded gasoline fuel of claim 2, wherein the olefin content of the fuel is 6 volume percent or less.

9. The unleaded gasoline fuel of claim 2, wherein the olefin content of the fuel is 5 volume percent or less.

5        10. The unleaded gasoline fuel of claim 2, wherein the olefin content of the fuel is 3 volume percent or less.

11. The unleaded gasoline fuel of claim 2, wherein the olefin content of the fuel is no greater than about 2 volume percent.

12. The unleaded gasoline fuel of claim 2, wherein the fuel has a 50%  
10    D-86 Distillation Point no greater than 210°F.

13. The unleaded gasoline fuel of claim 2, wherein the fuel has a 90% D-86 Distillation Temperature no greater than 300°F.

14. The unleaded gasoline fuel of claim 1, wherein the fuel has a 50% D-86 Distillation Temperature between 210 and 220°F, and/or a 90% D-86  
15    Distillation Temperature between 300 and 330°F.

Sub B2  
15. An unleaded gasoline fuel, which is substantially free of oxygenates and has a Reid vapor pressure less than 7.5 psi;  
a sulfur content less than 30 ppmw; and  
a 50% D-86 Distillation Temperature greater than 210 but no greater than  
20    220°F,  
and the fuel composition falls the California Predictive Model requirements for emissions.

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16. The unleaded gasoline fuel of claim 15, wherein the olefin content is 8 volume percent or less.

17. The unleaded gasoline fuel of claim 16, wherein the fuel has a Reid vapor pressure no greater than 7.0.

5 18. The unleaded gasoline fuel of claim 15, wherein the fuel contains no greater than 20 ppmw sulfur.

19. The unleaded gasoline fuel of claim 16, wherein the fuel contains no greater than 20 ppmw sulfur.

10 20. The unleaded gasoline fuel of claim 16, wherein the fuel contains no greater than 15 ppmw sulfur.

~~21. The unleaded gasoline fuel of claim 16, wherein the fuel contains no greater than 10 ppm sulfur.~~

22. The unleaded gasoline fuel of claim 16, wherein the olefin fuel content is 6 volume percent or less.

15 23. The unleaded gasoline fuel of claim 16, wherein the olefin fuel content is 5 volume percent or less.

24. The unleaded gasoline fuel of claim 16, wherein the olefin fuel content is 3 volume percent or less.

20 25. The unleaded gasoline fuel of claim 16, wherein the olefin fuel content is no greater than about 2 volume percent.

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26. The unleaded gasoline fuel of claim 16, wherein the aromatic hydrocarbon content is no greater than 25 volume percent.

27. The unleaded gasoline fuel of claim 16, wherein the fuel has a 90% D-86 Distillation Temperature no greater than 300°F.

5        28. The unleaded gasoline fuel of claim 16, wherein the fuel has an aromatic hydrocarbon content between 25 and 30 volume percent, and/or a 90% D-86 Distillation Temperature between 300 and 330°F.

~~29. The unleaded gasoline fuel of claim 28 wherein the olefin content is less than 5 volume percent and the fuel contains no greater than 20 ppmw sulfur.~~

10        30. An unleaded gasoline fuel, which is substantially free of oxygenates and has a Reid vapor pressure less than 7.5 psi;  
Sub 331  
a sulfur content less than 30 ppmw; and  
a 90% D-86 Distillation Temperature between 300 and 330°F,  
and the fuel composition fails the California Predictive Model requirements  
15 for emissions.

31. The unleaded gasoline fuel of claim 30, wherein the olefin content is 8 volume percent or less.

32. The unleaded gasoline fuel of claim 31, wherein the fuel has a Reid vapor pressure no greater than 7.0.

20        33. The unleaded gasoline fuel of claim 30, wherein the fuel has no greater than 20 ppmw sulfur.

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34. The unleaded gasoline fuel of claim 31, wherein the fuel contains no greater than 20 ppmw sulfur.

35. The unleaded gasoline fuel of claim 31, wherein the fuel contains no greater than 15 ppmw sulfur.

5 36. The unleaded gasoline fuel of claim 31, wherein the fuel contains no greater than 10 ppm sulfur.

37. The unleaded gasoline fuel of claim 31, wherein the olefin fuel content is 5 volume percent or less.

10 38. The unleaded gasoline fuel of claim 31, wherein the olefin fuel content is 3 volume percent or less.

39. The unleaded gasoline fuel of claim 31, wherein the olefin fuel content is no greater than about 2 volume percent.

40. The unleaded gasoline fuel of claim 31, wherein the aromatic hydrocarbon content is no greater than 25 volume percent.

15 41. The unleaded gasoline fuel of claim 31, wherein the fuel has a 50% D-86 Distillation Point no greater than 210°F.

42. The unleaded gasoline fuel of claim 31, wherein the fuel has an aromatic hydrocarbon content between 25 and 30 volume percent, and/or a 50% D-86 Distillation Temperature between 210 and 220°F.

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43. The unleaded gasoline fuel of claim 42, wherein the olefin content is 5 volume percent or less and the fuel contains no greater than 20 ppmw sulfur.

44. A method for operating an automotive vehicle having a spark-ignited, internal combustion engine, comprising:

5 introducing into the engine the unleaded gasoline fuel of claim 1, and then combusting the unleaded gasoline in the engine.

45. The method of claim 44, wherein the automotive vehicle also has a catalytic converter into which at least some of the engine exhaust emissions created by combusting the unleaded gasoline is introduced, with emissions then  
10 being discharged from the catalytic converter and subsequently to the atmosphere.

46. The method of claim 44, wherein the introduction into the engine of an unleaded gasoline is accomplished by fuel injection.

47. The method of claim 45, wherein the introduction into the engine of an unleaded gasoline is accomplished by fuel injection.

15 48. The method of claim 45, wherein the gasoline introduced into the engine has a Reid vapor pressure no greater than 7.0.

~~49. The method of claim 45, wherein the gasoline introduced into the engine has less than 20 ppmw of sulfur.~~

~~50. The method of claim 45, wherein the gasoline introduced into the  
20 engine contains no greater than 15 ppmw sulfur.~~

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51. The method of claim 45, wherein the gasoline introduced into the engine contains no greater than 10 ppmw sulfur.

52. The method of claim 45, wherein the gasoline introduced into the engine contains 5 volume percent olefin or less.

5 53. The method of claim 52, wherein the gasoline fuel introduced into the engine has an olefin content of 3 volume percent or less.

54. The method of claim 52, wherein the gasoline has an olefin content of no greater than 2 volume percent.

55. A method for operating an automotive vehicle having a spark-ignited,  
10 internal combustion engine, comprising:  
introducing into the engine the unleaded gasoline fuel of claim 15, and then  
combusting the unleaded gasoline in the engine.

56. The method of claim 55, wherein the automotive vehicle also has a  
catalytic converter into which at least some of the engine exhaust emissions  
15 created by combusting the unleaded gasoline is introduced, with emissions then  
being discharged from the catalytic converter and subsequently to the atmosphere.

57. The method of claim 55, wherein the introduction into the engine of  
an unleaded gasoline is accomplished by fuel injection.

58. The method of claim 56, wherein the introduction into the engine of  
20 an unleaded gasoline is accomplished by fuel injection.

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59. The method of claim 56, wherein the gasoline introduced into the engine has a Reid vapor pressure no greater than 7.0.

~~60. The method of claim 56, wherein the gasoline introduced into the engine has no greater than 20 ppmw of sulfur.~~

5 61. The method of claim 56, wherein the gasoline introduced into the engine contains no greater than 15 ppmw sulfur.

~~62. The method of claim 56, wherein the gasoline introduced into the engine contains no greater than 10 ppmw sulfur.~~

10 63. The method of claim 56, wherein the gasoline introduced into the engine contains 5 volume percent olefin or less.

64. The method of claim 56, wherein the gasoline fuel introduced into the engine has an olefin content of 3 volume percent or less.

65. The method of claim 56, wherein the gasoline has an olefin content of no greater than 2 volume percent.

15 66. A method for operating an automotive vehicle having a spark-ignited, internal combustion engine, comprising:  
introducing into the engine the unleaded gasoline fuel of claim 30, and then  
combusting the unleaded gasoline in the engine.

20 67. The method of claim 66, wherein the automotive vehicle also has a catalytic converter into which at least some of the engine exhaust emissions

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created by combusting the unleaded gasoline is introduced, with emissions then being discharged from the catalytic converter and subsequently to the atmosphere.

68. The method of claim 66, wherein the introduction into the engine of an unleaded gasoline is accomplished by fuel injection.

5 69. The method of claim 67, wherein the introduction into the engine of an unleaded gasoline is accomplished by fuel injection.

70. The method of claim 67, wherein the gasoline introduced into the engine has a Reid vapor pressure no greater than 7.0.

10 ~~71. The method of claim 67, wherein the gasoline introduced into the engine has no greater than 20 ppmw of sulfur.~~

~~72. The method of claim 67, wherein the gasoline introduced into the engine contains no greater than 15 ppmw sulfur.~~

~~73. The method of claim 67, wherein the gasoline introduced into the engine contains no greater than 10 ppmw sulfur.~~

15 74. The method of claim 67, wherein the gasoline introduced into the engine contains 5 volume percent olefin or less.

75. The method of claim 67, wherein the gasoline fuel introduced into the engine has an olefin content of 3 volume percent or less.

20 76. The method of claim 67, wherein the gasoline has an olefin content of no greater than 2 volume percent.

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p. 1